8.0 LONG-RANGE TRANSPORT CHALLENGE

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Under the Great Lakes Binational Toxics Strategy, EC and US EPA committed to:

> *"Assess atmospheric inputs of Strategy substances to the Great Lakes. The aim of this effort is to evaluate and report jointly on the contribution and significance of long-range transport of Strategy substances from worldwide sources. If ongoing long-range sources are confirmed, work within international frameworks to reduce releases of such substances."*

In support of this challenge, the U.S. and Canada have:

- Maintained the Integrated Atmospheric Deposition Monitoring Network (IADN),
- Improved the integration of monitoring networks and data management,
- Continued research on the atmospheric science of toxic pollutant transport, and
- Worked through existing international frame works to reduce releases of Strategy substances and better assess the significance of long-range transport.

Workshop on Long-Range Transport of Toxic Substances

Following the Strategy's 4-step analytical framework to evaluate and report jointly on the contribution and significance of long-range transport of Strategy substances from worldwide sources, EC and US EPA are organizing a workshop on the long-range transport of toxic substances to the Great Lakes. The long-range transport workshop will further EC's and US EPA's progress toward addressing Steps 1 (Information Gathering) and 2 (Analysis). The workshop will convene worldwide experts on long-range transport to address specific questions related to the long-range transport challenge. These questions include:

- Do we have enough information and data to evaluate the impact of long-range atmospheric transport on loadings and the achievement of GLBTS challenges?
- What is the contribution of long-range transport on loadings to and burdens in the Great Lakes? What contribution is intra-continental transport (outside of Great Lakes Basin) and what contribution is global transport (outside of North America)?
- What are the knowledge gaps and uncertainties that limit the ability of EC and US EPA to assess the significance of long-range transport of Level I and II Strategy substances?
- What emerging chemicals should we be most concerned about with respect to their long-range transport characteristics and use worldwide?
- Based on what we can definitively say about the impacts of long-range transport to the Great Lakes, how can the GLBTS best integrate this knowledge into current and future management strategies for the Great Lakes?

EC and US EPA are currently planning to hold this workshop in the summer of 2003.

LRT Update 2002 – Canadian Activities

Numerical Investigation of Budget and Loading of g-hexachlorcyclohexane over the Great Lakes Ecosystem - by J. Ma and S.M. Daggupaty, Meteorological Service of Canada

A coupled regional scale atmospheric transport, soil-air, and water-air exchange model was developed to investigate the effects of atmospheric transport, reemission, and loadings of γ-hexachlorcyclohexane (γ-HCH) to the Great Lakes. Numerical experiments were conducted for the period May 1, 1998 to April 30, 1999 in a region of Canada and part of the United States. The coupled model was executed with two γ-HCH emission (usage) scenarios–one with all sources in the Canadian portion of the model domain and a second excluding sources in the cornfields of Ontario and Quebec provinces. Model results show that strong soil-air exchange occurs during the warm period of the year. Strong net outgasing from soils (volatilization) into the air takes place in the source regions (croplands) where γ-HCH was applied as an insecticide. In non-source regions where soil was assumed to be not contaminated initially, deposition is stronger during the tilling and warm periods than during the cold period of the year. Air concentrations decrease considerably in autumn and winter seasons, and increase during the following spring, indicating that the change in the air temperature plays an essential role in the reduction and increase of soil-to-air transfer of γ-HCH (Figure 8-1). It was found that changes in γ-HCH burden in the atmosphere around and over the Great Lakes depend primarily upon the γ-HCH usages and volatilization in the *canola fields in Canadian prairie-provinces* and upon subsequent long-range transport from this source region. The contribution from γ-HCH usage in the cornfields of Ontario and Quebec to the overall γ-HCH budget and to the Great Lakes is negligible. Table 8-1 lists measured (from IADN network) and modeled (from two model runs) daily γ-HCH concentrations averaged over the summer of 1998. Modeled dry and wet depositions to the Great Lakes are higher in the summer than those in the autumn and winter seasons. The upper Great Lakes (Lakes Superior, Michigan, and Huron) receive more γ-HCH due to deposition. *Absorption* due to net gas exchange occurs in Lakes Michigan, Huron, and Ontario in the summer, and *volatilization* occurs in the autumn and winter seasons of the year in all five lakes.

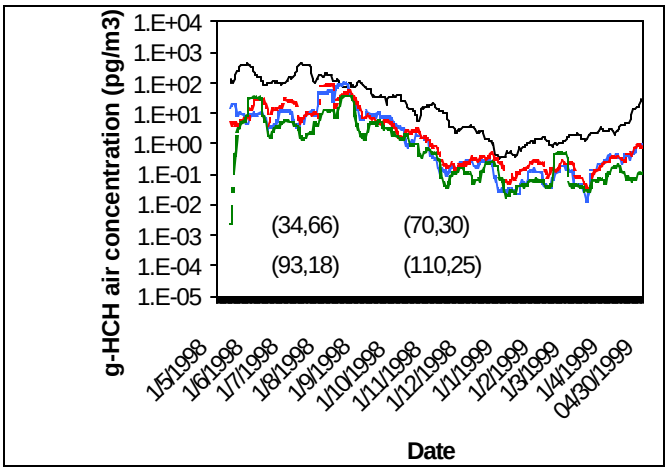

Figure 8-1. Modeled Running Average Daily Air Concentrations at Selected Grids from May 1, 1998 to April 30, 1999.

Grid (34,66) is located at a canola field in Saskatchewan. Grid (93,18) is located at a cornfield in Ontario. Grids (70,30) and (110,25) are located at the west of Lake Michigan and St. Lawrence valley where γ-HCH was not applied.

Table 8-1. Modeled and Measured Air Concentrations (pg m^{-3}) Averaged over Summer 1998 from Two Runs

	PPT	BNT	STP	SBD	EGH
IADN	19.0	15.2	51.4	42.5	28.1
RUN1	26.6	17.6	25.6	29.0	26.5
RUN2	26.1	17.6	24.8	28.9	26.3

**PPT: Point Petre, model grid (101,23)*
BNT: Burnt Island, model grid (87,29)
STP: Sturgeon Point, model grid (96,18)
SBD: Sleeping Bear Dunes, model grid (78,25)
EGH: Eagle Harbor, model grid (74,35)

Lindane Transport to the Great Lakes Region from Application Areas in Saskatchewan

A journal paper on the Multi-compartment Environmental Diagnosis and Assessment (MEDIA) model was published in Chemosphere. The citation for this article is provided below.

Koziol A. & J. Pudykiewicz, 2001: Global-scale environmental transport of persistent organic pollutants. Chemosphere, Volume 45, Issue 8, December 2001, p. 1181.